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LISTS OF SPECIES

Melastomataceae from the "Parque Estadual do Guartelá", Tibagi, Paraná, Brazil: Species list and field guide

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ABSTRACT: We studied an area with "Cerrado" associated to other vegetation types at the "Parque Estadual do Guartelá", Tibagi, in the state of Paraná, Brazil. Herein, we have a list with all species of Melastomataceae recorded in the area with an illustrated guide including all of them. Despite the small area of this Conservation Unit, the park hosts a large number of species (36), in the following genera: *Acisanthera*, *Chaetostoma*, *Lavoisiera*, *Leandra*, *Miconia*, *Tibouchina* and *Trembleya*. The region where the park is located is considered the southern limit of the "Cerrado" biome, and also the limit of distribution of many Melastomataceae species. The distribution of the Melastomataceae species along the different vegetation types in the PEG seems to be a pattern for the family in general, registered also for other areas of "Cerrado" in Brazil.

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INTRODUCTION

Melastomataceae occurs in tropical and subtropical regions (Clausing and Renner 2001), and in different vegetation types in Brazil (Goldenberg *et al.* 2012). It is one the richest families in the "Campos Rupestres" and "Cerrado" (Romero and Martins 2002; Goldenberg *et al.* 2012). The family has been traditionally organized in tribes (Cogniaux 1891; Renner 1993), from which three are the most common in both vegetation types cited above: Microlicieae has several genera almost restricted to "Campos Rupestres" and "Cerrado", while Melastomeae and Miconieae have widespread genera that are also rich in forested areas (Romero 2003; Goldenberg *et al.* 2012).

Taxonomic studies on the family in Brazil have recently been summarized by Goldenberg et al (2012). Complete state floras were published only for Santa Catarina (Wurdack 1962) and São Paulo (Martins 2009), while local floras and generic treatments are more common (Goldenberg *et al.* 2012). For the state of Paraná, there are works on taxonomy of *Miconia* Ruiz and Pav. (32 spp.; Goldenberg 2004), *Leandra* Raddi (43 spp.; Camargo and Goldenberg 2007; Camargo *et al.* 2009), *Tibouchina* Aubl. (30 spp.; Meyer *et al.* 2010), as well as for other less rich genera (total of 18 spp.; Goldenberg *et al.* 2005; Meyer and Goldenberg 2012).

The flora of the "Cerrado" has been extensively studied in Brazil (Ratter *et al.* 2003), but studies on its southern borders are still scarce (Takeda *et al.* 1996; von Linsingen *et al.* 2006; Carmo *et al.* 2012). This is the case of some isolated remnants areas of "Cerrado" in the state of Paraná, where the flora is less rich than in the core areas up to the north but, on the other hand, has a large number of endemic species (Uhlmann *et al.* 1998; Hatschbach *et al.* 2005; von Linsingen *et al.* 2006; Cervi *et al.* 2007; Carmo M.R.B, unpublished data). These remnants of "Cerrado" in Paraná are highly endangered, due to the naturally small size of the fragments and also to human activities like agriculture, urban expansion, and silviculture based on exotic species (Paraná 1995; Moro 2001). Moreover, 10.3% of the endangered species that were officially recorded to Paraná occur in "Cerrado" remnants (Paraná 1995). This scenario shows that the Parana´s "Cerrado" and "Campos Rupestres" have been quickly depauperate, before a good account on its specific composition has been completed (Carmo *et al.* 2012).

The "Parque Estadual do Guartelá" (PEG) is located in the center of the state, in an area with a complex vegetation that includes "Cerrado", grasslands and atlantic forest elements. There are studies on geology and geomorphology (Retzlaf *et al.* 2006), and a few on the flora of the park (Takeda *et al.*1996; Michelon and Labiak 2013; Carmo M.R.B, unpublished data). The latter listed 634 species for the area, among which 26 were Melastomataceae.

In this paper, we intend to provide a complete list of the Melastomataceae species registered in the area, adding also information on the habit and occurrence of these species in the different vegetation types sampled. We also provide pictures of living plants for all species, making this an illustrated guide for the Melastomataceae of the "Parque Estadual do Guartelá".

MATERIAL AND METHODS

Study area

The PEG is located in a region locally known as "Campos Gerais" (Figure 1), on an area ("Escarpa Devoniana") formed from paleozoic sediments (Maack 1981). It is one of the most important conservation units at the "Campos Gerais", and is kept by the state government. It is also part of a broader protection area ("Área de Proteção Ambiental

da Escarpa Devoniana"). The vegetation at the PEG (Figure 2) is made up mostly by different types of grasslands ("Estepe Gramíneo-Lenhosa" — EGL; "Campo Úmido" — CU; and "Campo Rupestre" — CR), and also by *Araucaria* forests ("Floresta Ombrófila Mista" — FOM) and one of the last remnants of "Cerrado" ("Savana Arborizada" — SA) in the state of Paraná (Veloso *et al.* 1991; Carmo *et al.* 2012)."

The climate is Cfa according to Koeppen's classification, which means subtropical, wet and warm, with indirect influence of Cfb (temperate and wet). In the region, the monthly mean temperature is 18.7°C, with frequent frosts during the dry winter. Monthly mean precipitation is 116.23 mm; rain is more intense in January and February (SIMEPAR–"Estação Meteorológica de Telêmaco Borba").

Methods

Monthly collection trips were done between March 2011 and March 2013, and the samples deposited in the herbarium UPCB. Herbarium collections from the herbaria

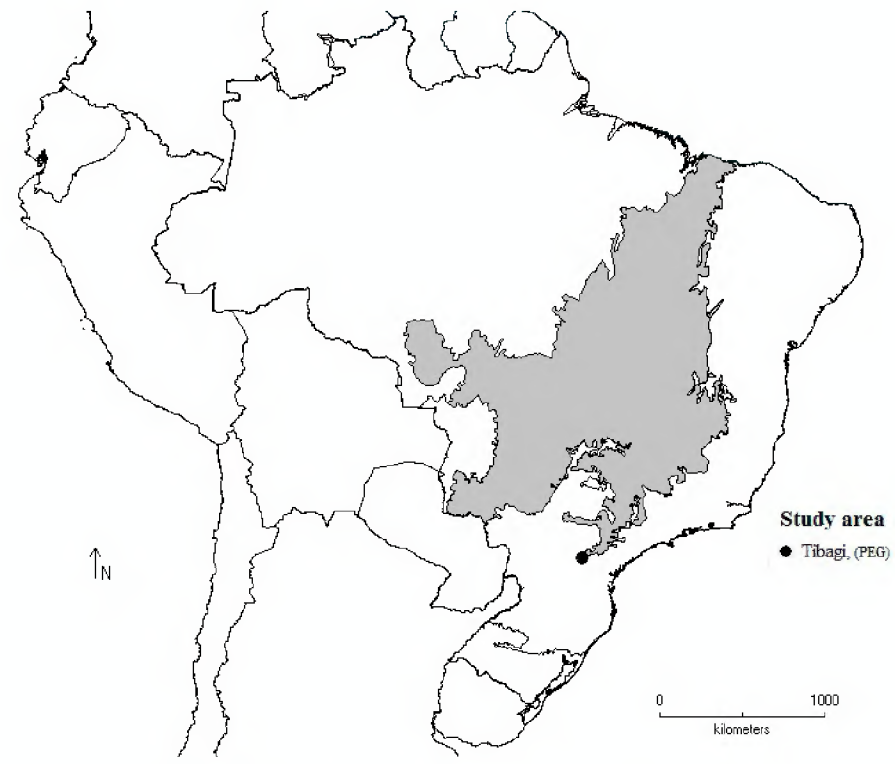

Figure 1. Map showing the "Parque Estadual do Guartelá", Tibagi, Paraná, Brazil, at the southern limits of the Cerrado.

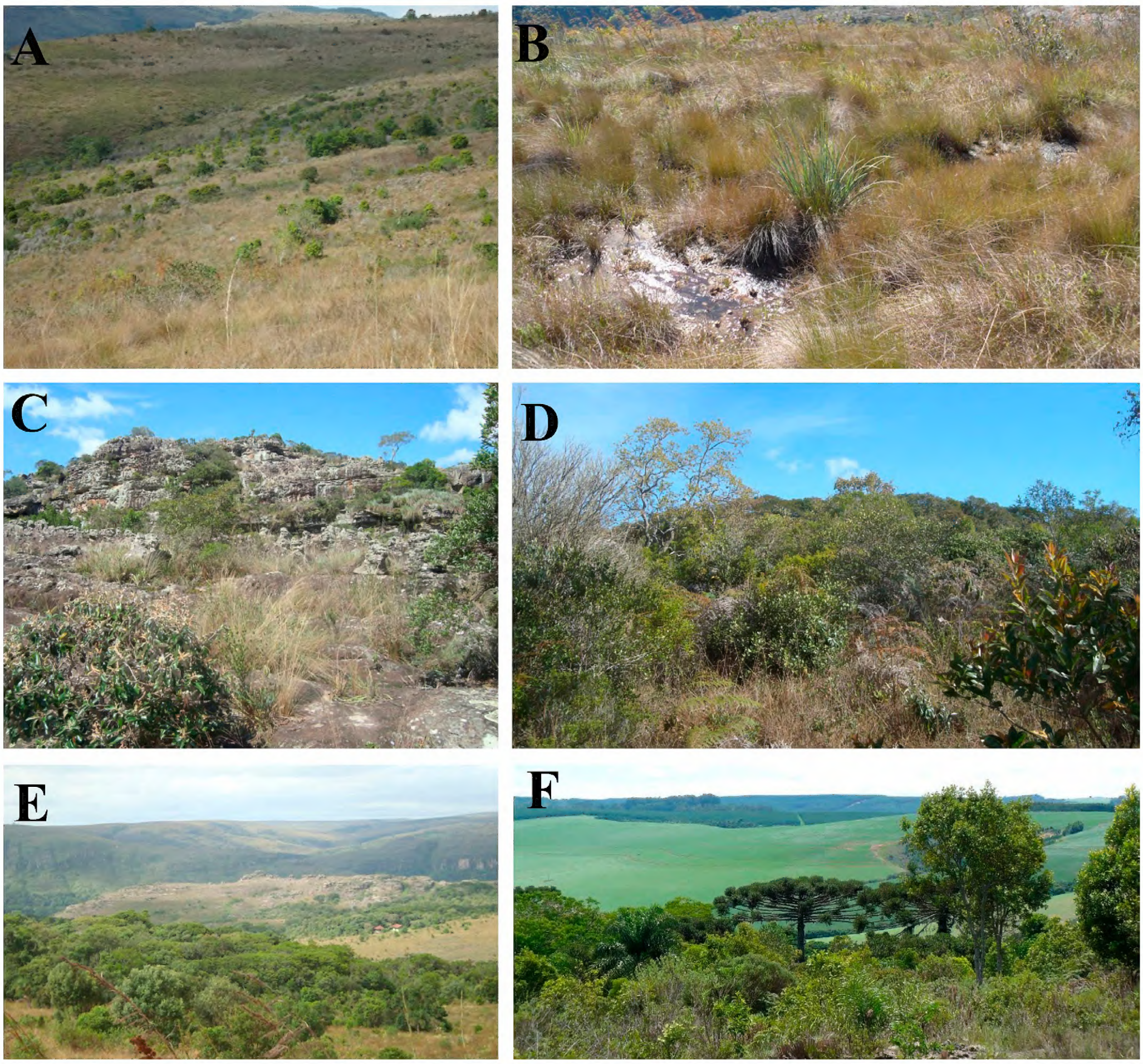

Figure 2. Vegetation types in the "Parque Estadual do Guartelá", Tibagi, Paraná, Brazil: A - Estepe gramíneo-lenhosa; B – Campo úmido; C – Campo Rupestre; D – Cerrado ; E – Floresta Ombrófila Mista; F – Vegetation in the PEG, surrounded by oat fields and *Pinus* sp.). (A, C-E – the authors; B – Danieli Aparecida de Moraes; F – Pedro Ortman Cavalin)

Table 1. List of species of Melastomataceae in the "Parque Estadual do Guartelá", Tibagi, Paraná. Vegetation types: EGL – Estepe Gramíneo - Lenhosa; CU – Campo Úmido; CR – Campo Rupestre; CER – Cerrado; FOM – Floresta Ombrófila Mista. Habit: hrb. – herb; sbshr. – subshrub; shr – shrub; collectors: (CE - Eduardo de Camargo; MFR – Fabiano Maia; MF – Fabrício Meyer; MJ – Julia Meirelles; MC – Marta do Carmo; FT – Tássia Fendrich; GR – Renato Goldenberg;)

TRIBE / SPECIES	VEGETATION TYPES					HABIT	VOUCHER
	EG-L	CU	CR	CER	FOM		
Melastomeae							
Acisanthera alsinaelifolia Triana	X		X	X		hrb.	MFR 77
Pleroma guartelaensis F.S. Meyer & R. Goldenb.	X					shr.	MF 753
Tibouchina debilis (Cham.) Cogn.	X		X	X		sbshr.	MFR 29
Tibouchina fothergillae (DC.) Cogn.					X	shr.	MFR 55
Tibouchina gracilis (Bonpl.) Cogn.	X		X	X		sbshr.	MFR 76
Tibouchina hatschbachii Wurdack.	X		X			shr.	MFR 38
Tibouchina herincquiana Cogn.	X		X	X		hrb.	MFR 69
Tibouchina heteromalla (D. Don) Cogn.					X	shr.	MF 190
Tibouchina martialis (Cham.) Cogn.	X		X	X		shr.	MFR 31
*Tibouchina sellow*iana Cogn.	X				X	shr.	MFR 36
Tibouchina ursina (Cham.) Cogn.	X	X				shr.	MFR 73
Miconieae							
Leandra acutiflora (Naud.) Cogn.		X			X	sbshr.	GR 700
Leandra aurea (Cham.) Cogn.	X		X	X	X	shr.	MFR 46
Leandra australis (Cham.) Cogn.					X	sbshr. or shr.	MFR 65
Leandra eichleri Cogn.	X				X	subarb.	MFR 66
Leandra erostrata (DC.) Cogn.		X		X	X	sbshr. or shr.	CE 174
Leandra melastomoides Raddi					X	shr.	MFR 67
Leandra microphylla Cogn.			X			hrb.or sbshr.	MFR 62
Leandra polystachya Cogn.	X		X	X	X	sbshr.	MFR 53
Leandra purpurascens (DC.) Cogn.					X	sbshr. or shr.	MFR 28
Leandra regnelli (Triana) Cogn.					X	sbshr. or shr.	MC 520
Leandra salicina (DC.) Cogn.					X	sbshr. or shr.	MC 631
Leandra variabilis Raddi					X	shr.	MJ 362
Miconia albicans (Sw.) Steud.	X		X	X		shr.	MFR 40
Miconia cinerascens Miq.					X	shr.	MFR 30
Miconia hyemalis A.St.-Hil. & Naudin	X		X	X	X	shr.	MFR 27
Miconia ligustroides (DC.) Naudin.	X	X	X	X	X	shr.	MFR 35
Miconia petropolitana Cogn.					X	shr.	FT 181
Miconia sellowiana Naudin.	X	X	X	X	X	shr.	MFR 45
Miconia theaezans (Bonpl.) Cogn.		X				shr.	FT 185
Microlicieae							
Chaetostoma armatum (Spreng.) Cogn.	X	X	X			hrb.or sbshr.	MFR 33
Chaetostoma sp.		X				hrb.or sbshr.	MFR 89
Lavoisiera imbricata DC.	X	X	X			sbshr.	MFR 34
Lavoisiera pulchella Cham.	X	X	X			sbshr.	MFR 79
Trembleya parviflora (D. Don) Cogn.	X	X	X	X	X	shr.	MFR 43
Trembleya phlogiformis DC.	X			X		sbshr. or shr.	MC 863

MBML, UPCB, and HUPG (acronyms following "Index Herbarium" available at http://sweetgum.nybg.org/ih) were also analyzed.

Additional information on vegetation type followed Carmo *et al* (2012; see above at the "study area" section). Data on distribution came from Romero and Martins (2002), Goldenberg (2004), Meyer and Goldenberg (2010, 2012, 2014), and Meirelles and Goldenberg (2012).

Results

Melastomataceae has 36 species in the PEG (Table 1). These species belong to seven genera from three tribes: *Acisanthera* P. Browne (1 species) and *Tibouchina* Aubl. (10), from tribe Melastomeae (Figure 3); *Leandra* Raddi (12) (Figure 4) and *Miconia* Ruiz and Pav. (7) (Figure 5) from tribe Miconieae; and *Chaetostoma* DC. (2), *Lavoisiera* DC. (2), and *Trembleya* DC. (2), from tribe Microliceae (Figure 6). These species vary from herbs to shrubs and trees (Table 1).

Half of the species occur exclusively in grasslands (including EGL, CU, CR), with 18 species from all genera (Table 1). All species of Microlicieae (genera *Chaetostoma*, *Lavoisiera* and *Trembleya*) are restricted to these grasslands. The species occurring in forests (FOM), mostly belonging to *Leandra* and *Miconia*, are frequent along the borders of forest patches or along the streams. *Trembleya parviflora* and some species of *Leandra*, *Miconia* and *Tibouchina* occur in different vegetation types, both in forests and grasslands (Table 1). The two cultivated species, both belonging to *Tibouchina*, are found near an old farm house, near to a stream.

Among the species found in the area there are one undescribed species, *Chaetostoma* sp. which seem to be endemic to the state of Paraná. *Leandra microphylla* (see Reginato and Goldenberg 2012), *Pleroma guartelaensis* (Meyer and Goldenberg 2014) and *Tibouchina henricquiana* (Meyer *et al.* 2010) are endemic to grasslands on arenitic outcrops in the states of Paraná and São Paulo. *Tibouchina*

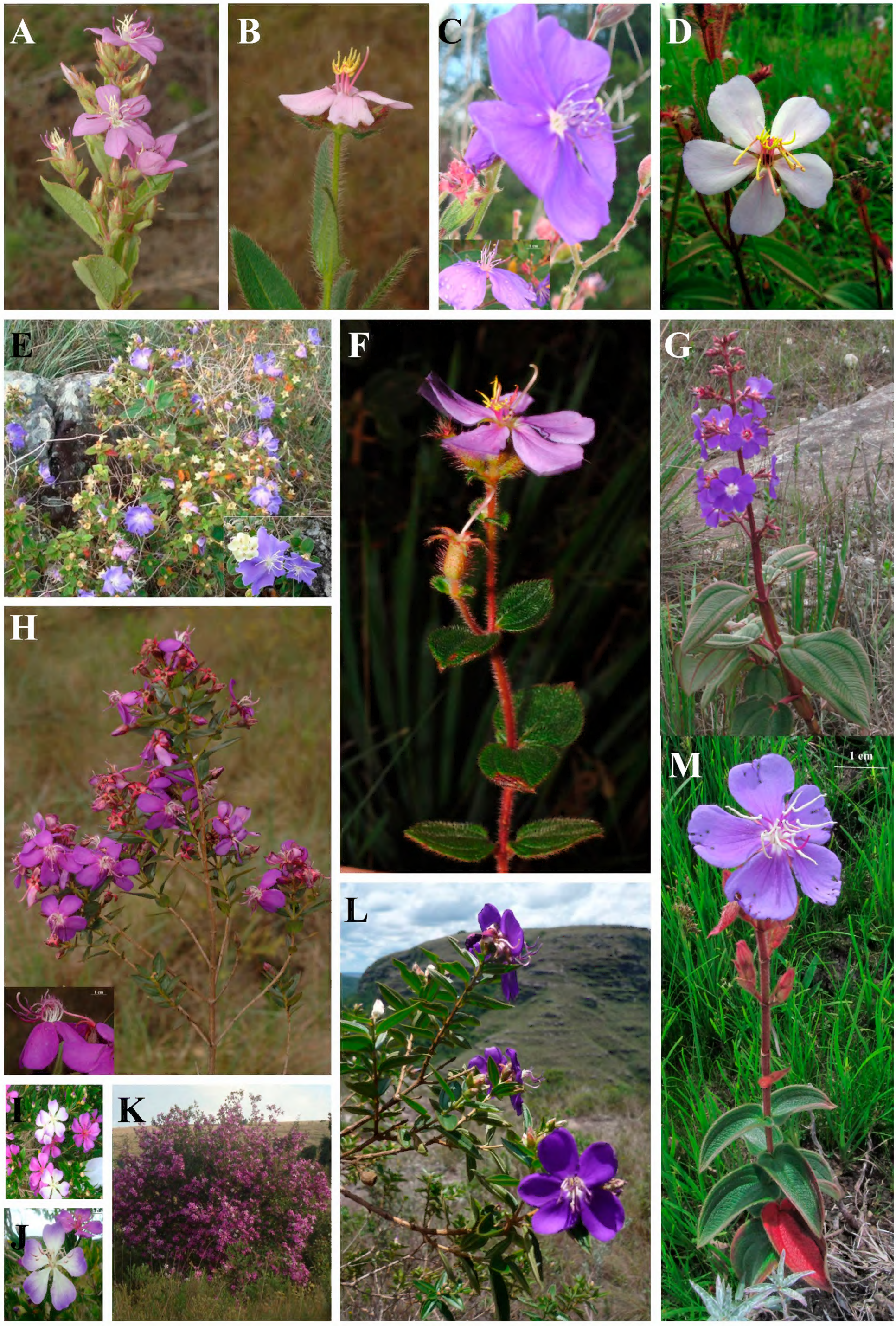

Figure 3. Species of Melastomataceae, tribe Melastomeae in the "Parque Estadual do Guartelá", Tibagi, Paraná, Brazil: A – *Acisanthera alsinaefolia*; B – *Tibouchina debilis*; C – *T. forthegillae*; D – *T. gracilis*; E – *T. hatschbachii*; F – *T. herincquiana*; G – *T. heteromalla*; H – *T. martialis*; I, J – Flowers of *T. sellowiana*; K – *T. sellowiana*; L – *Pleroma guartelaensis*, M – *T. ursina* (A–C, E, F, H–L: the authors; D, G, M: Meyer, F. S.).

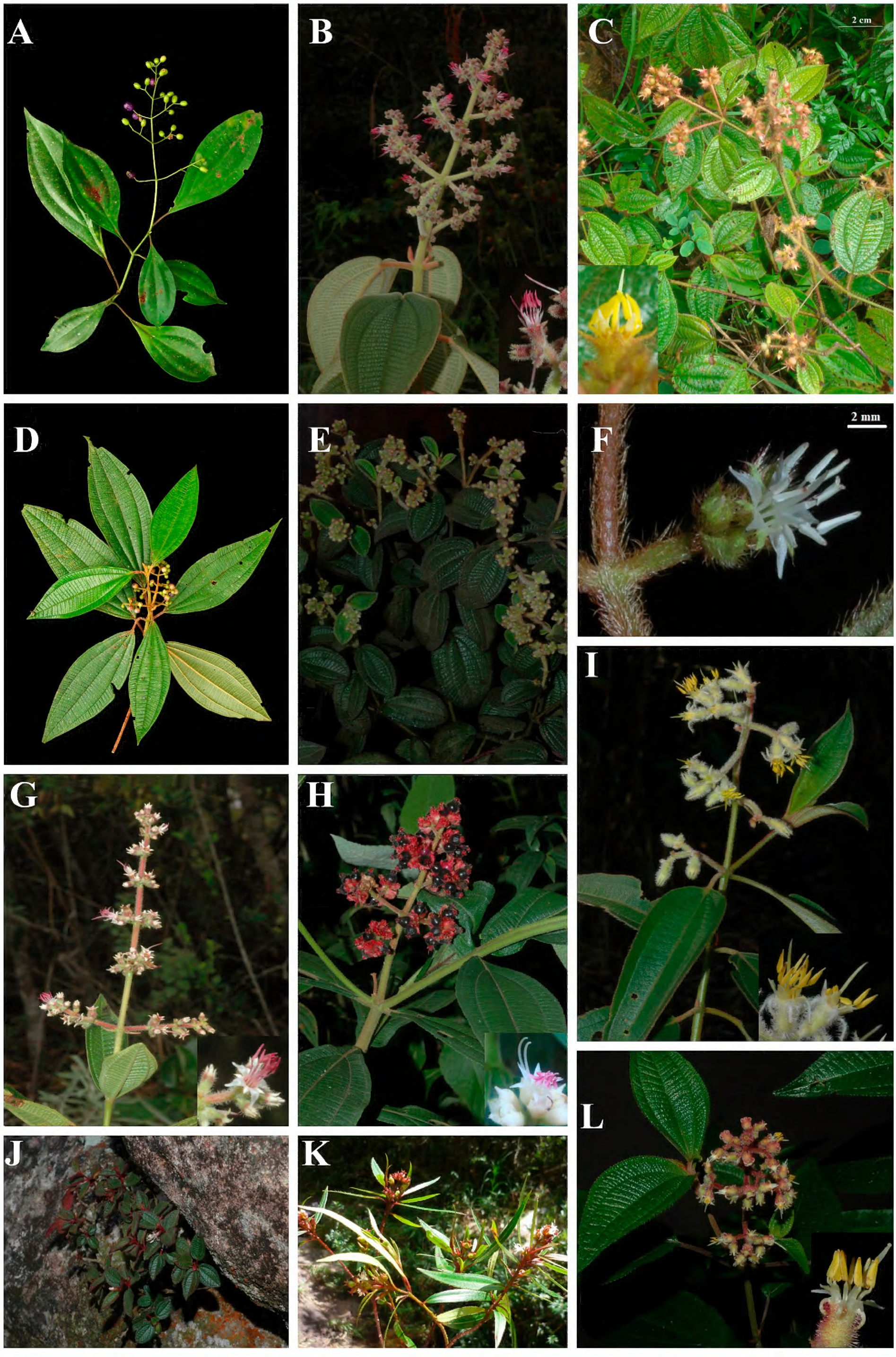

Figure 4. Species of Melastomataceae, tribe Miconieae, genus *Leandra*, in the "Parque Estadual do Guartelá", Tibagi, Paraná, Brazil: A – *Leandra acutiflora*; B – *L. aurea*; C – *L. australis*; D – *L. variabilis*; E – *L. erostrata*; F – *L. eichleri*; G – *L. polystachya*; H – *L. melastomoides*; I *L. purpurascens*; J – *L. microphylla*; K – *L. salicina*; L – *L. regnelli* (A, D – Meyer, F. S.; B, C, E-L – the authors).

hatschbachii occurs in the same areas, plus some grasslands on granitic outcrops and is endemic to the same states as the species above (Meyer *et al.* 2010).

Discussion

All species of Melastomataceae recorded in the same area by Carmo, M.R.B. (unpublished data) were confirmed here. Nevertheless, nine species reported here had not been recorded in the same list, despite the fact that the PEG is one of the most densely sampled areas in the "Campos Gerais do Paraná". Some species names reported by Carmo, M.R.B. (unpublished data) have been updated: *Chaestostoma pungens* DC., *Lavoisiera phyllocalycina* Cogn., *L. dasytricha* (A. Gray) Cogn., *Leandra dusenii* Cogn., *L. lacunosa* Cogn., *L. parvifolia* Cogn. and *L. simplicicaulis* Cogn. are currently accepted respectively as *C. armatum* (Kotschnitzke and Martins 2006) *L. imbricata*, (Martins, A.B. and Almeda, F., unpublished data) *L. variabilis* and *L. microphylla* (Reginato and Goldenberg 2012), *L. aurea, L. salicina* and *L. polystachya* (Camargo *et al* 2009). Melastomataceae is the fourth richest family in the PEG, after Poaceae, Asteraceae and Cyperaceae (Carmo, M.R.B, unpublished data; Carmo *et al.* 2012). These families are usually the richest ones in brazilian grasslands (Hatschbach and Moreira-Filho 1972; Bastos 1984; Giulietti *et al.* 1987; Girardi-Deiro *et al.* 1992; Conceição and Giulietti 2002; Tannus and Assis 2004).

The distribution of Melastomataceae species along the different vegetation types in the PEG follows the same patterns as shown by Romero and Martins (2002) and Goldenberg *et al.* (2012). These authors recognize two groups of Melastomataceae in "Cerrado" (which includes "Campos Rupestres): the first one with capsular-fruited genera that are almost restricted to it, like *Acisanthera*, *Chaetostoma*, *Lavoisiera* and *Trembleya*; and the second

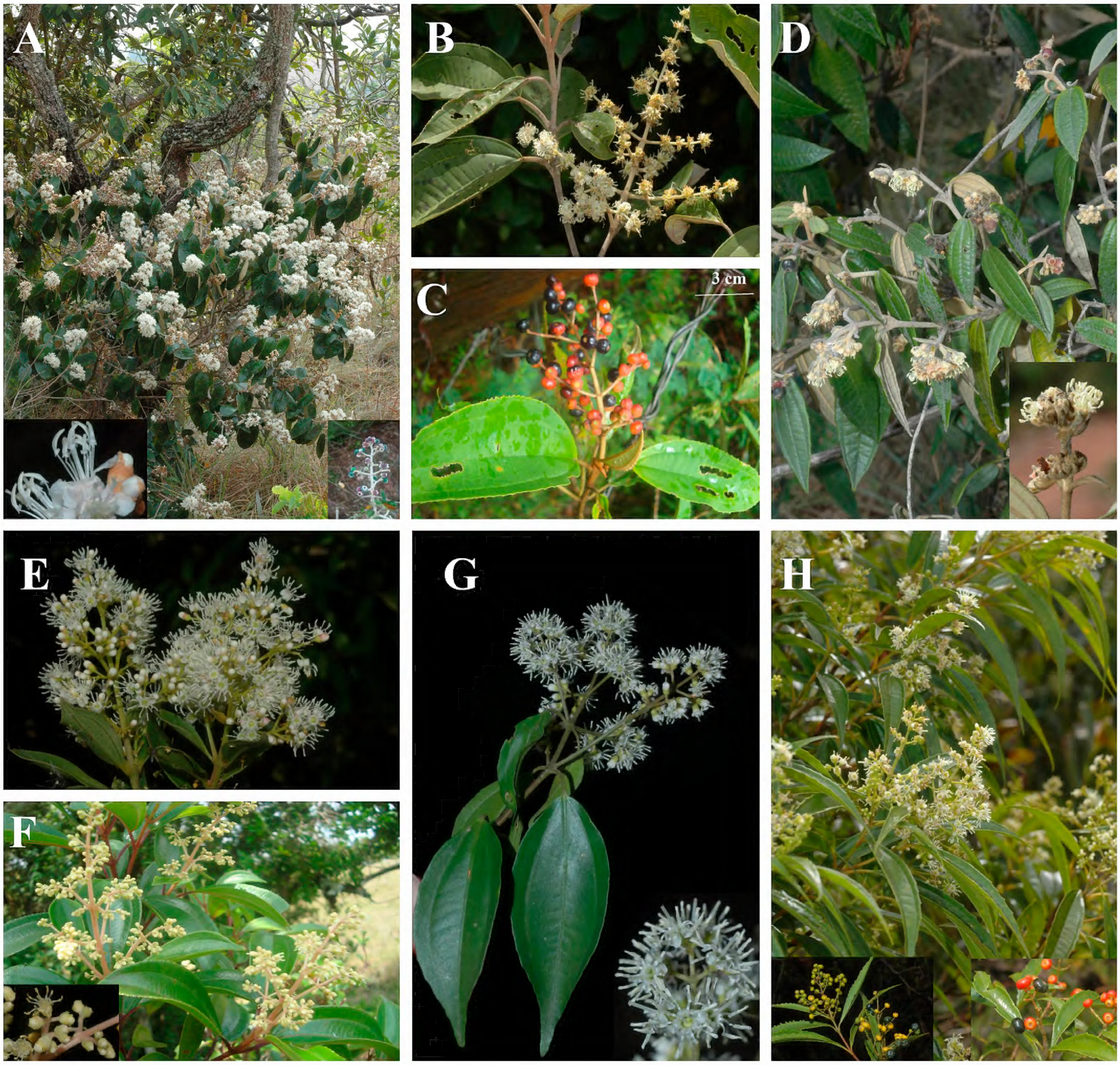

Figure 5. Species of Melastomataceae, tribe Miconieae, genus *Miconia*, in the Parque Estadual do Guartelá, Tibagi, Paraná, Brazil: A – *Miconia albicans*; B, C – *M. cinerascens*; D – *M. hyemalis*; E – *M. ligustroides*; F – M. *theizans*; G – *M. petropolitana*; G – *M. sellowiana* (all by the authors)

one with the widespread genera that also occur in forests, like the capsular-fruited *Tibouchina* and the berry-fruited *Leandra* and *Miconia*. Melastomataceae floras from other areas in the "Campos Rupestres" also mention the large number of species belonging to the familiy: "Serra do Cipó" (Minas Gerais) has 90 species (Semir *et al.* 1987), "Pico das Almas" (Bahia), 21 species (Baumgratz *et al.* 1994), "Serra da Canastra" (Minas Gerais), 95 species (Romero and Martins 2002), "Carrancas" (Minas Gerais), 42 species (Matsumoto and Martins 2005), Delfinópolis (Minas Gerais), 52 species (Silva and Romero 2008), and "Parque Estadual do Itacolomi" (Minas Gerais), 72 species (Rolim, T.R. dados não publicados).

Despite being a small conservation unit in an area that is marginal in terms of the distribution of the family, the PEG hosts a large number of species of Melastomataceae. It is surely important for the conservation of plant species, since the region has suffered a strong decrease in its natural areas due to anthropic activities (Paraná 1995; Moro 2001).

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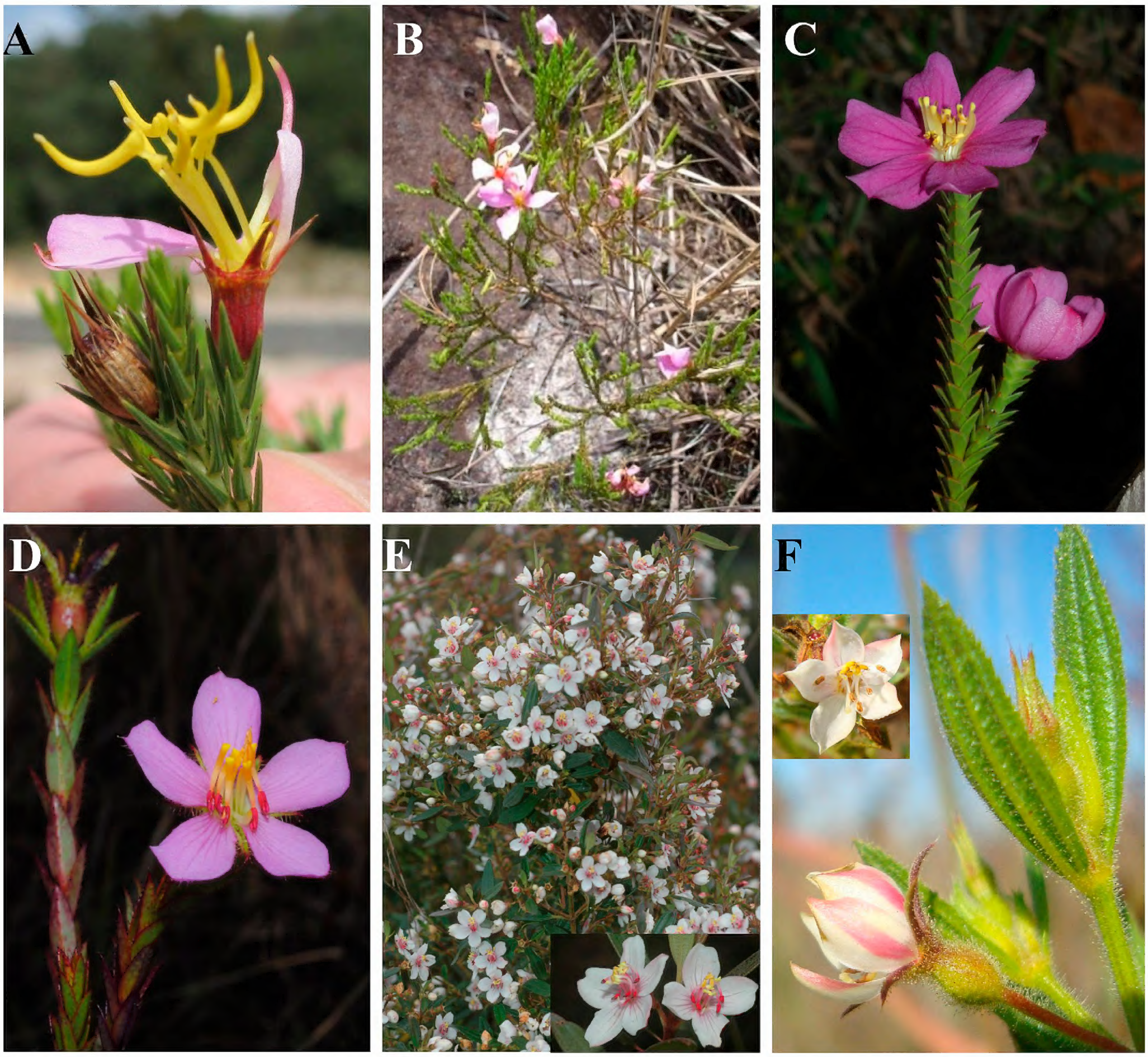

Figure 6. Species of Melastomataceae, tribe Microlicieae in the "Parque Estadual do Guartelá", Tibagi, Paraná, Brazil: A – *Chaetostoma armatum*; B – Chaetostoma sp.; C - *Lavoisiera imbricata*; D – *L. pulchella*; E – *Trembleya parviflora*; F – *T. phlogiformis* (A–E: the authors; F: Bacci, L.)

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